Ontario Water Resources Commission
Divsion of plant operations.

ONTARIO MINISTRY OF ENVIRONMENT
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1971 OPERATING SUMMARY

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RICHMOND HILL

WATER POLLUTION CONTROL PLANT

TD
367
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1971

Richmond Hill : water pollution control plant.
81838

Water management in Ontario

Ontario
Water Resources
Commission

We are pleased to submit for your consideration a summary of operation during 1971 of the water pollution control plant serving your community.

This operating summary contains parameters normally used to measure plant performance and loading, as well as relevant cost data. Because of the concern over eutrophication of our lakes and of the requirement, in many parts of Ontario, to remove the major contributing factor, results of analysis for phosphorus appear in this summary.

D.S. Caverly,
General Manager.

D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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RICHMOND HILL

WATER POLLUTION CONTROL PLANT

operated for

THE TOWN OF RICHMOND HILL

by the

ONTARIO WATER RESOURCES COMMISSION

1971 ANNUAL OPERATING SUMMARY

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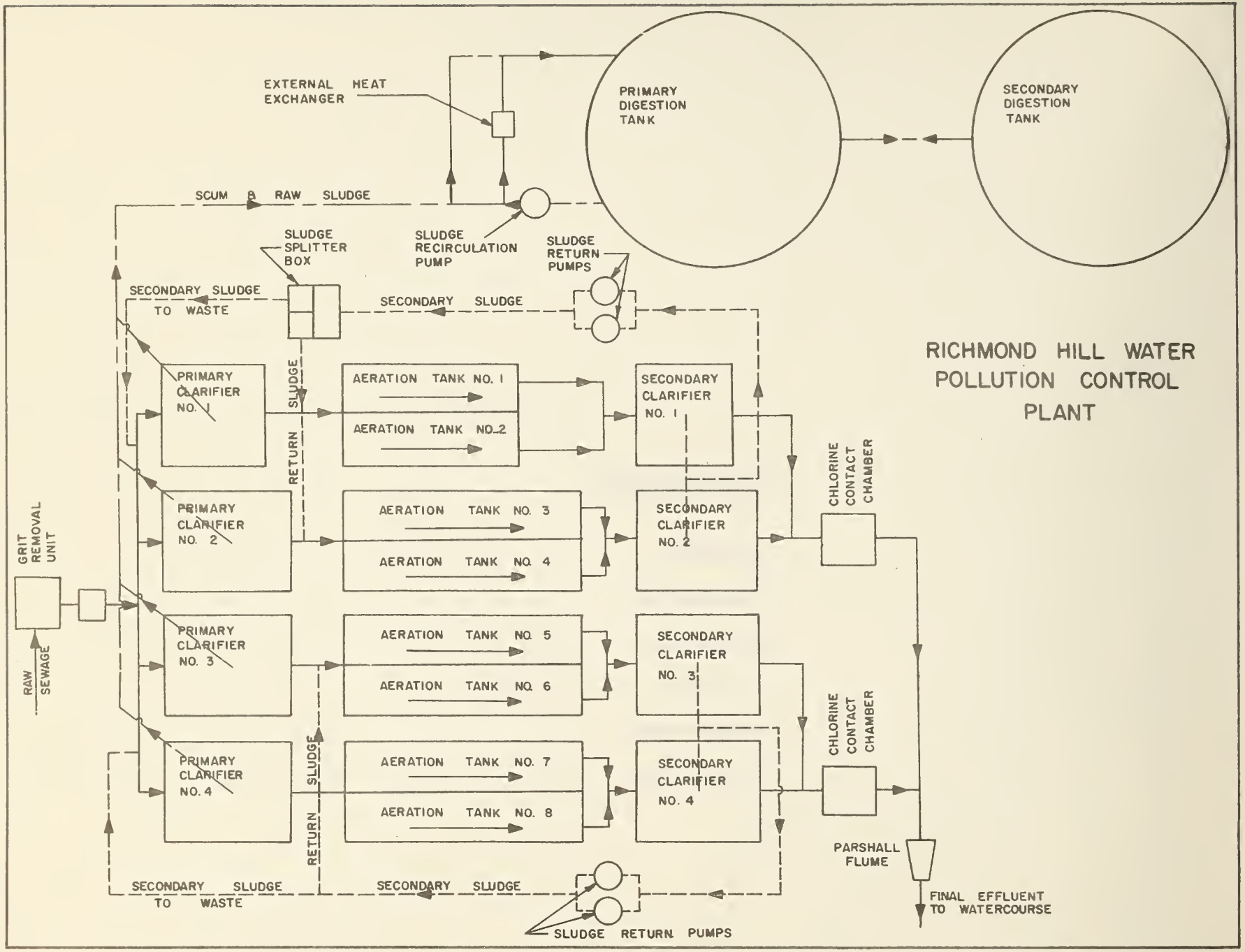
EXTERNAL HEAT EXCHANGER
PRIMARY DIGESTION TANK
SECONDARY DIGESTION TANK
SCUM & RAW SLUDGE
SLUDGE SPLITTER BOX
SLUDGE RECIRCULATION PUMP
SLUDGE RETURN PUMPS
SECONDARY SLUDGE TO WASTE
SECONDARY SLUDGE
RICHMOND HILL WATER POLLUTION CONTROL PLANT
PRIMARY CLARIFIER NO. 1
SLUDGE
RETURN
AERATION TANK NO. 1
AERATION TANK NO. 2
SECONDARY CLARIFIER NO. 1
CHLORINE CONTACT CHAMBER
PRIMARY CLARIFIER NO. 2
AERATION TANK NO. 3
AERATION TANK NO. 4
SECONDARY CLARIFIER NO. 2
GRIT REMOVAL UNIT
PRIMARY CLARIFIER NO. 3
AERATION TANK NO. 5
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RAW SEWAGE
PRIMARY CLARIFIER NO. 4
AERATION TANK NO. 7
AERATION TANK NO. 8
SECONDARY CLARIFIER NO. 4
PARSHALL FLUME
FINAL EFFLUENT TO WATERCOURSE
SECONDARY SLUDGE TO WASTE
SECONDARY SLUDGE
SLUDGE RETURN PUMPS

DESIGN DATA

PROJECT NO. 2-0006-57

TREATMENT Activated Sludge

DESIGN FLOW 1.60 mgd

DESIGN POPULATION 16,000

BOD - Raw Sewage 200 mg/l
- Removal 90%

SS - Raw Sewage 220 mg/l
- Removal 95%

PRIMARY TREATMENT

Grit Removal

Type: Aerated
Size: One 15½' x 6' x 9' swd (5,220 gal)
Retention: 4.7 min

Primary Sedimentation

Type: Dorr
Size: One 16' dia x 10' swd
One 26' dia x 10' swd
Two 26' dia x 9.7' swd
(110,000 gal)
Retention: 1.65 hr
Loading: Surface, 908 gal/ft^2/day
Weir, 4880 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; single-pass
Size: Two 58' x 9' x 9'
Two 81' x 14½' x 10¼'
Four 81' x 14½' x 9 1/3'
(482,700 gal)
Retention: 7.2 hr

Diffusers

- Carborundum diffusers

Air Supply

a) Type: Standaire (C.P.)
Size: One 400 scfm
Two 510 scfm

b) Type: Sutorbilt
Size: One 1,000 scfm

Secondary Sedimentation

Type: Dorr
Size: One 19' dia x 10' swd
One 30' dia x 10' swd
Two 30' dia x 9.7' swd
(147,180 gal)
Retention: 2.21 hr
Loading: Surface, 667 gal/ft^2/day
Weir, 4120 gal/ft/day

CHLORINATION

Type: W & T
Size: One 200 lb/day

Chlorine Contact Chamber

Size: Two 25' x 10' x 8' (25,000 gal)
Retention: 22½ min

OUTFALL

- to German Mills Creek

SLUDGE HANDLING

Digestion System - two-stage

Primary --
Type: Walker, 1 draft tube
Size: One 50' dia x 20' swd (39,200 ft^3 or 0.245 mil gal)

Secondary--
Type: Dorr (has one draft tube)
Size: One 30' dia x 19' swd (13,400 ft^3 or 83,500 gal)

'71 Review

GENERAL

This project consists of 3 connected activated sludge plants of different capacities and constructed at different times with a total treatment capacity of 1.6 mgd.

A new 85' diameter storm flow and equalizing tank was in service by June, 1971. This tank is intended to operate on a fill and draw process whereby during periods of high flow, that portion which the plant cannot process is by-passed to the equalizing tank and is returned to the plant for treatment during low flows. Thus the plant tends to operate closer to its design capacity for longer periods.

A water-proofing compound was applied to the inside walls of the digester. Two applications were necessary to prevent leaking. The digester will be operable early in 1972.

A complete mechanical and electrical inspection of the equipment was performed. Numerous deficiencies were noted and steps were taken to correct these.

PLANT FLOWS and CHLORINATION

The total flow to the plant during 1971 was 865 million gallons. The average daily flow was 2.3 million gallons while the maximum daily flow was 3.0 million gallons. The maximum flow rate to the plant was 3.0 million gallons per day. A total of 42,600 pounds of chlorine was used during the year. An average dose of 4.9 mg/l was applied to maintain an 0.5 residual in the effluent.

PLANT EFFICIENCY

The influent BOD and suspended solids averaged 240 mg/l and 320 mg/l respectively. The effluent BOD and suspended solids averaged 13 mg/l and 16 mg/l respectively. These results indicate an average reduction of 94 percent BOD and 95 percent suspended solids. The 66 percent total phosphorus removal experienced is normal for a secondary treatment plant.

SLUDGE DIGESTION and DISPOSAL

A total of 4,976,000 gallons of raw sludge containing 4.5 percent total solids was pumped to a holding tank.

A private sludge contractor hauled 16,175 cubic yards from the plant for disposal on land.

CONCLUSIONS

The plant operated well during the year discharging an effluent which on the average met Commission standards.

A more complete plant process will be achieved when the digester is returned to operation.

PROJECT COSTS

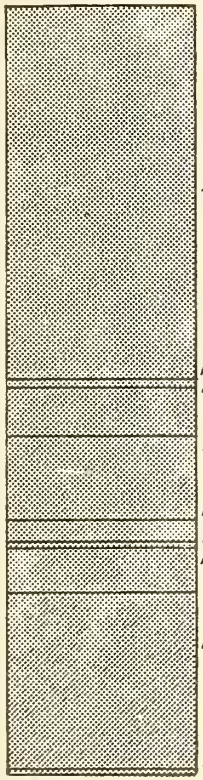
NET CAPITAL COST (Final)	$359,420.34
DEDUCT - Portion financed by CMHC/MDLB (Final)	-
Long Term Debt to OWRC	$359,420.34
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1971	$134,304.93
Net Operating	$ 76,760.00
Debt Retirement	2,214.00
Reserve	1,663.34
Interest Charged	20,160.18
TOTAL	$100,797.52

RESERVE ACCOUNT

Balance @ January 1, 1971	$ 22,996.54
Deposited by Municipality	1,663.34
Interest Earned	1,526.64
	$ 26,186.52
Less Expenditures	4,343.00
Balance @ December 31, 1971	$ 21,843.52

1971 COSTS

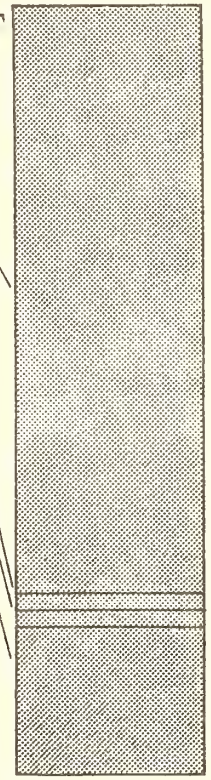
OPERATING COSTS



PAYROLL	49 %
FUEL	1 %
POWER	7 %
CHEMICALS	10 %
GENERAL SUPPLIES	2 %
EQUIPMENT	< 1 %
REPAIRS & MAINTENANCE	7 %
SUNDRY	23 %
WATER	NIL %
TRAVEL	< 1 %

TOTAL ANNUAL COST

NET OPERATING	76 %
DEBT RETIREMENT	2 %
RESERVE	2 %
INTEREST	20 %



YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			$ per million gal	¢ per lb BOD
1967	663.776	$56,375.17	$84.93	6 cents
1968	704.89	53,637.43	76.09	6 cents
1969	769.7	60.794.64	78.98	7 cents
1970	822.5	78,533.04	95.50	8 cents
1971	865.	76,760.00	88.70	4 cents

MONTHLY OPERATING COSTS

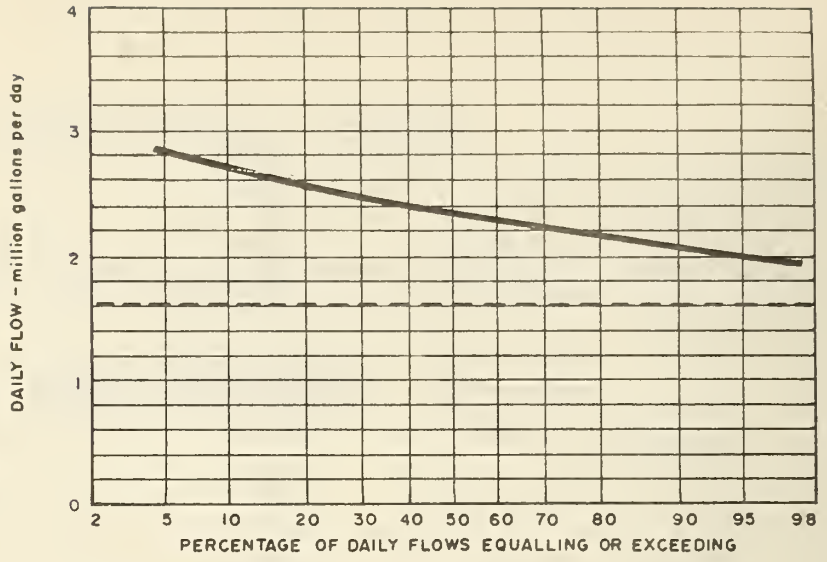
MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	2716.86	2524.12	-	-	-	42.42	150.32	-	-	-	-	-
FEB	7081.14	3736.55	-	188.58	633.58	871.77	92.87	-	166.80	1345.09	-	45.90
MAR	4063.18	2522.51	-	172.83	518.80	581.18	90.63	-	38.76	97.52	-	40.95
APR	7301.93	2520.87	-	143.22	659.57	581.18	57.84	-	421.73	2877.02	-	40.50
MAY	6887.17	2547.36	1022.48	-	510.60	556.50	121.29	-	909.51	1105.88	-	113.55
JUNE	6796.79	2748.13	193.34	-	530.31	1110.79	119.13	-	552.54	1510.60	-	31.95
JULY	5838.58	2506.74	514.93	-	514.22	336.33	242.40	-	142.21	1524.15	-	57.60
AUG	5487.26	2377.20	480.88	-	467.03	278.25	185.70	42.00	1656.20	-	-	-
SEPT	6815.17	1896.60	479.57	-	467.96	556.50	149.13	-	118.49	3111.82	-	35.10
OCT	5184.30	2926.06	480.87	-	514.16	834.75	92.36	-	52.97	249.53	-	33.60
NOV	9351.87	3450.64	470.87	-	419.50	486.28	196.64	-	565.18	3696.36	-	66.40
DEC	9235.75	3563.96	380.09	15.68	446.48	1391.25	404.58	199.21	434.39	2347.31	-	52.80
TOTAL	76760.00	33320.74	4023.03	520.31	5682.21	7627.20	1902.89	241.21	5058.78	17865.28	-	518.35

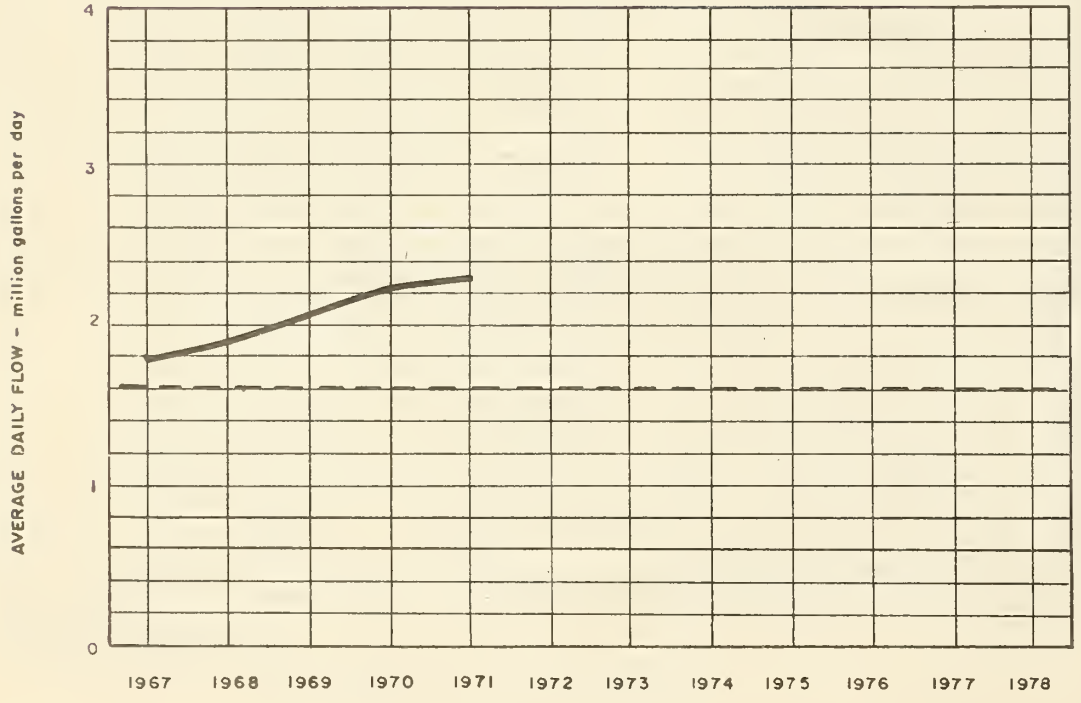
Brackets indicate credit.

* Sundry includes sludge haulage costs of $14,136.04

PROCESS DATA

FLOWS



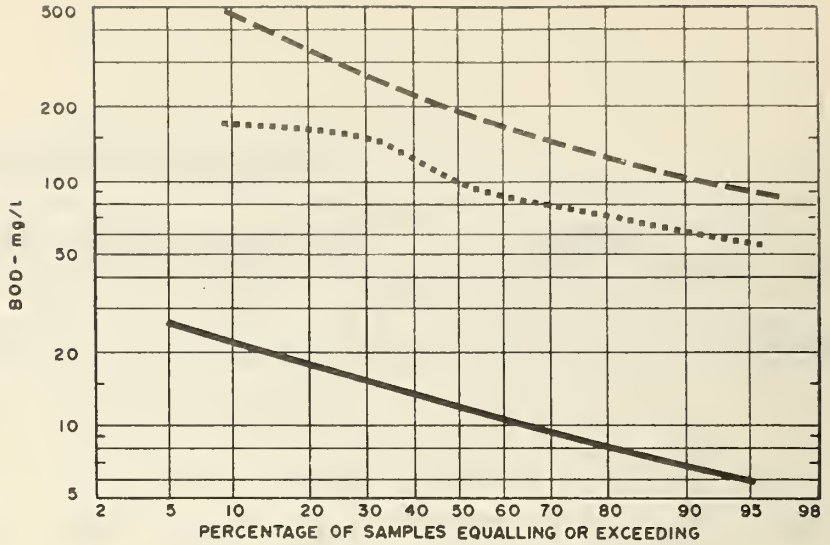


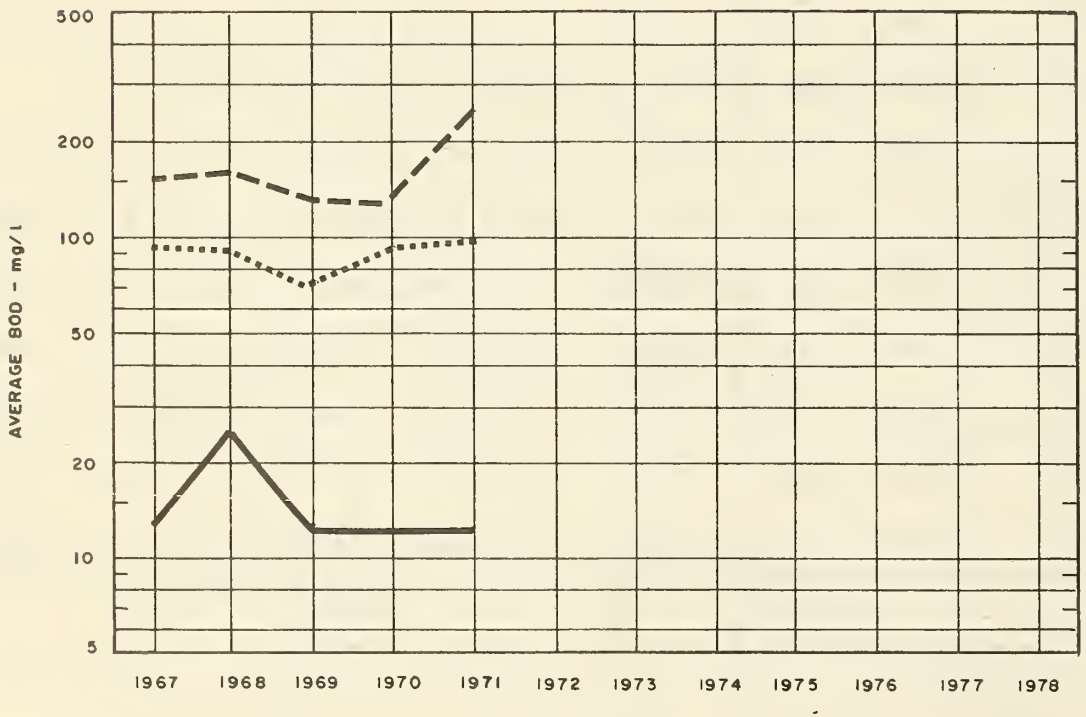
DESIGN CAPACITY _ _ _ _ _ _ _

PLANT PERFORMANCE

MONTH	FLOWS				BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				TOTAL PHOSPHORUS		
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	MAXIMUM RATE	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDN
	million gallons	mil gal	mil gal	mgd	mg/l	mg/l	%	10 3 pounds	mg/l	mg/l	%	10 3 pounds	mg/l as P	mg/l as P	%
JAN	70.	2.2	2.5	3.0	120	10	92	77.	160	15	91	101.	-	-	-
FEB	68.	2.4	3.0	3.0	380	11	97	250.	610	5	99	410.	18	5.0	72
MAR	86.	2.8	3.0	3.0	182	25	86	136.	295	55	81	207.	10	3.0	70
APR	81.	2.7	3.0	3.0	120	17	86	83.	130	15	88	93.	6	3.3	45
MAY	71.	2.3	2.5	3.0	340	11	97	233.	595	13	98	413.	23	-	-
JUNE	67.	2.2	2.5	3.0	245	16	93	154.	180	10	94	115.	13	4.1	68
JULY	69.	2.2	2.8	3.0	190	13	93	123.	360	10	97	240.	9	2.3	74
AUG	69.	2.2	2.8	3.0	165	14	92	104.	170	13	92	108.	10	3.8	62
SEPT	73.	2.4	2.8	3.0	197	11	94	135.	260	8	97	83.	8	4.2	48
OCT	68.	2.2	2.3	2.9	470	9	98	312.	490	5	99	329.	15	5.3	65
NOV	67.	2.2	2.4	2.7	165	6	96	106.	185	5	97	120.	7	5.3	39
DEC	76.	2.4	2.6	2.8	190	5	97	139.	230	10	96	170.	11	2.2	80
TOTAL	865.	-	-	-	-	-	-	1852.	-	-	-	2389.	-	-	-
AVG.	-	2.3	MAXIMUM 3.0	MAXIMUM 3.0	240	13	94	15.4	320	16	95	20.0	12	4.1	66
No. of Samples	-	-	-	-	22	21	-	-	19	22	-	-	18	17	-

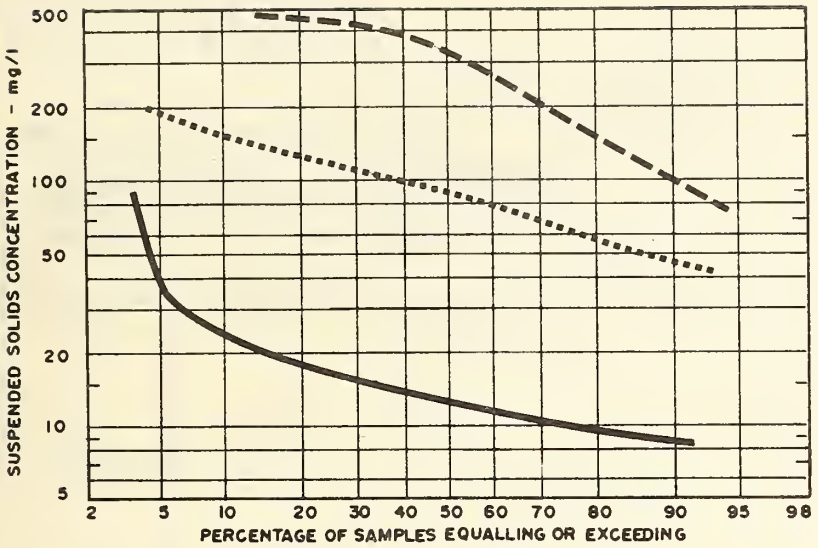
BIOCHEMICAL OXYGEN DEMAND

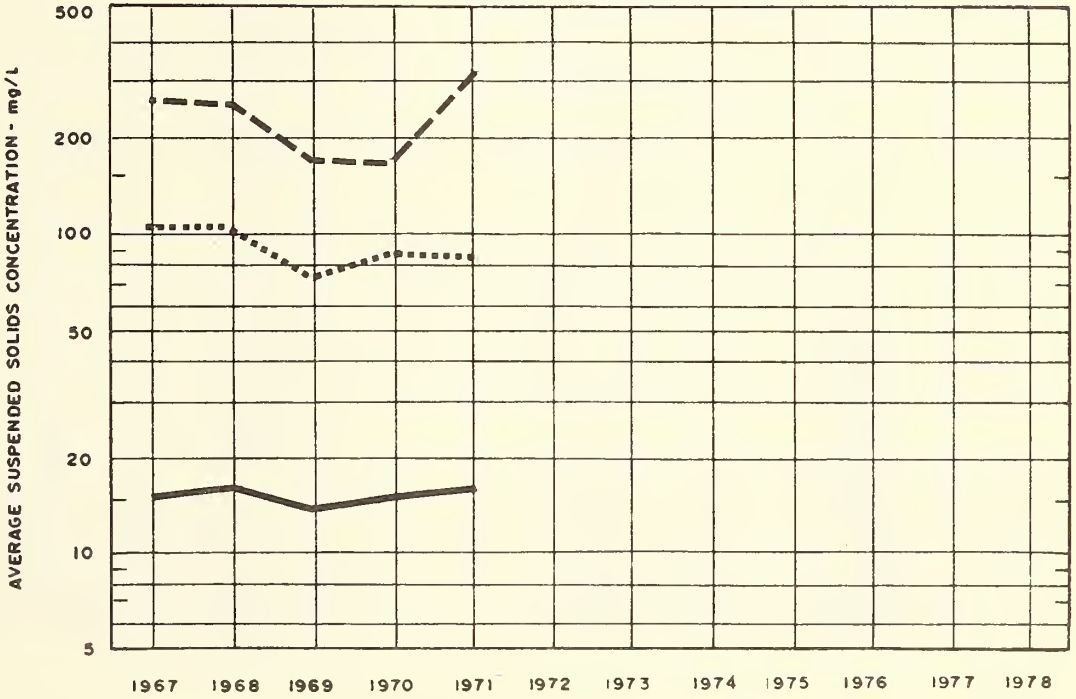




PLANT INFLUENT
PRIMARY EFFLUENT
PLANT EFFLUENT

SUSPENDED SOLIDS



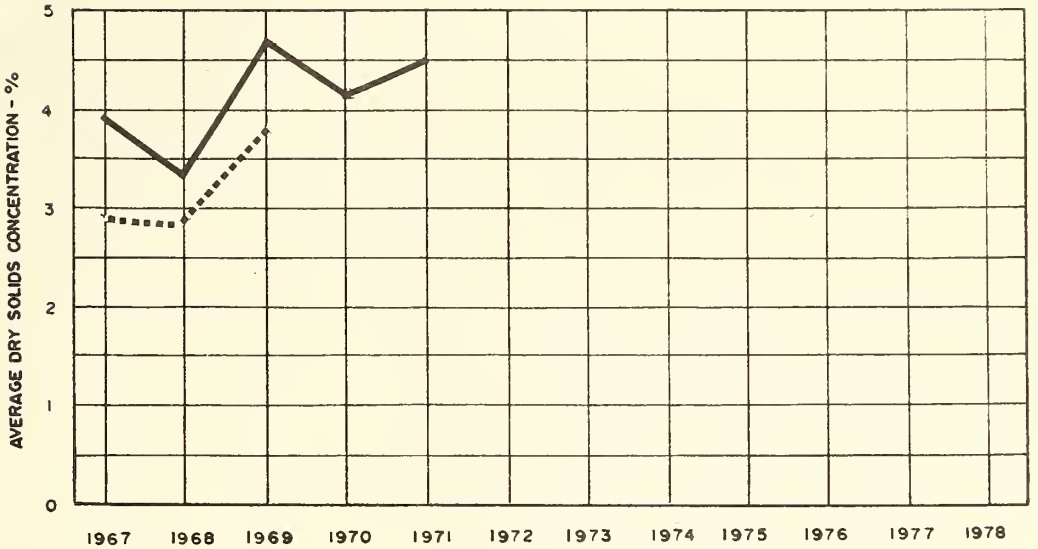


PLANT INFLUENT
PRIMARY EFFLUENT
PLANT EFFLUENT

TREATMENT DATA

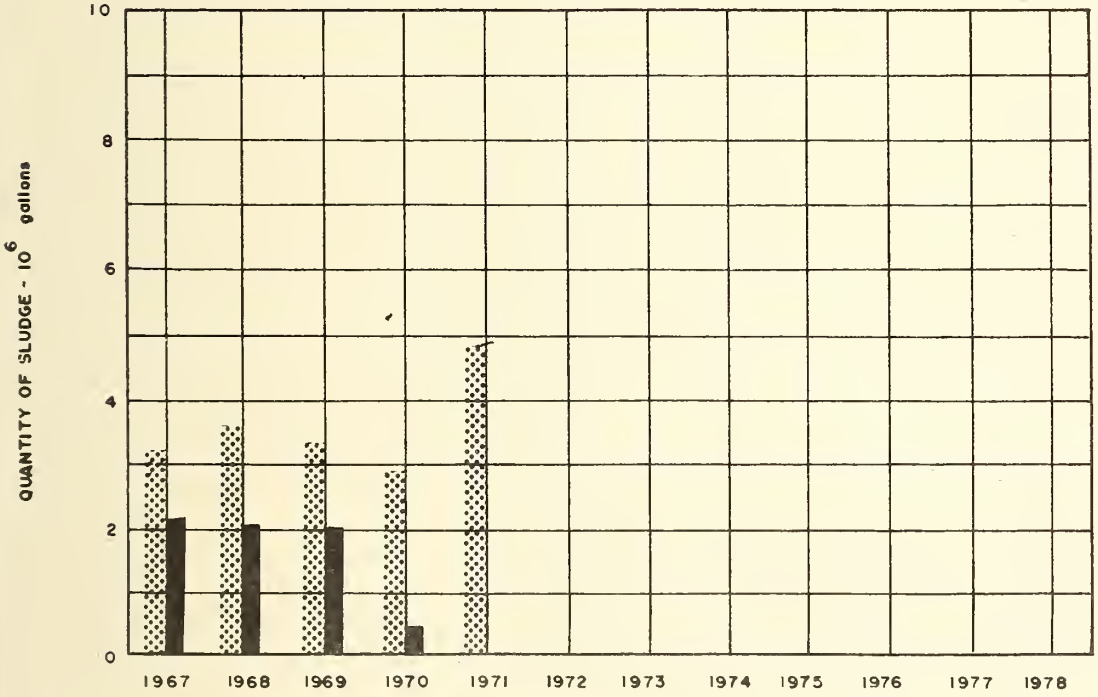
MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
									RAW SLUDGE			DIGESTED SLUDGE			SUPER-NATANT	
	QUANTITY REMOVED cubic feet	Cl_2 USED 10^3 pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day^{-1}	AIR $\frac{1000\ ft^3}{lb\ BOD}$	QUANTITY 10^5 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10^5 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	T. S. %	AMOUNT HAULED cubic yards
JAN	104	3.2	4.6	80	45	1340	.3	2.1	4.68	-	-	-	-	-	-	1488
FEB	96	3.0	4.5	145	100	1250	.6	.8	3.80	5.7	-	-	-	-	-	1188
MAR	93	4.1	4.7	64	73	1420	.3	2.2	4.03	3.2	-	-	-	-	-	1452
APR	96	3.9	4.8	85	100	1180	.4	1.5	2.82	-	-	-	-	-	-	972
MAY	98	3.2	4.6	93	88	1570	.3	1.7	2.91	-	-	-	-	-	-	1718
JUNE	99	3.2	4.8	80	95	1720	.2	2.4	3.84	-	-	-	-	-	-	1344
JULY	110	3.3	4.8	48	50	1560	.1	10.3	4.10	-	-	-	-	-	-	1245
AUG	99	4.2	6.1	80	75	1470	.2	1.6	4.26	7.6	-	-	-	-	-	1224
SEPT	689	3.8	5.2	123	136	1480	.4	1.3	5.06	4.5	-	-	-	-	-	1884
OCT	118	3.6	5.4	135	74	1560	.4	1.1	5.25	3.2	-	-	-	-	-	1620
NOV	114	3.4	5.2	110	70	1300	.4	1.3	4.77	3.5	-	-	-	-	-	1224
DEC	114	3.7	4.9	140	110	1310	.5	.9	4.24	3.8	-	-	-	-	-	816
TOTAL	1830	42.6	-	-	-	-	-	-	49.76	-	-		-	-	-	16175
AVG.	2.1 cu. ft/mil gal	3.6	4.9	98	84	1430	.3	2.3	4.14	4.5	-	-	-	-	-	1347

DIGESTION



RAW SLUDGE .....

DIGESTED SLUDGE ———



RAW SLUDGE TO DIGESTER

DIGESTED SLUDGE REMOVED

Date Loaned

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